PATENT SPECIFICATION

364,518

Application Date: Nov. 11, 1930. No. 21,672/31.

(Divided out of No. 364,248.)

Complete Accepted: Jan. 7, 1932.

COMPLETE SPECIFICATION.

Improvements in the Construction of Airships.

I, DAVID EDWARD ROSS, a citizen of the United States of America, of Lafayette, in the County of Tippecanoe, and State of Indiana, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is an improvement in dirigible air ships of the so-called "Zeppelin" type. The object of the present invention is to provide a frame for the body of the airship which will resist both longitudinal and torsional strains, will be of minimum weight for volumetric capacity, will be practically rigid but have sufficient flexibility to "breathe" without injuring any parts thereof, and will also be comparatively inexpensive to build.

The invention provides a dirigible frame having an internal compression member, external tension members, distending members for holding the tension members in position and is characterized by the provision of resilient members consisting of spring plates connected to the ends of the compression member to which plates the end of the tension members are connected to prevent excessive lateral deflecting stresses on the frame from breaking the said tension members.

In the accompanying drawings, Fig. 1 is a side view of a dirigible frame constructed in accordance with my invention the outer covering or "skin" being removed. Fig. 2 is a longitudinal section through Fig. 1 many of the tension members being omitted for the sake of clearness. Fig. 3 is an enlarged detail sectional view of the frame, the central portion thereof being broken away. Fig. 4 is an enlarged transverse section taken on the line 4—4 Fig. 1, and Figs. 5, 6 and 7 are detail views illustrating various forms of resilient end plates.

The central compression member 1 may be of any desired contour in cross section. It is preferably made hollow for the purpose of lightness and strength, and also preferably tapered from front to rear as indicated in Fig. 2. It may be made of any suitable metal having great strength and lightness.

Surrounding this compression member are a series of preferably annular distending members 2 and 2a, encircling the compression member 1 and axially centered relatively thereto by spokes 3 and 3a preferably attached to the compression member by means of hub pieces 4 and 4a.

A plurality of tension members 6, preferably rods or cables, are attached to the distending members 2 and 2a and to the ends of the compression member. These members 6 are arranged longitudinally of the frame and impart great stiffness thereto. A plurality of other tension members 7 extend spirally of the frame from one end of the compression member to the other. Two sets of members 7 are employed running spirally in opposite directions as indicated in Fig. 1, the intersecting diagonal tension member 7 forming a network enclosing the distending members and forming with members 6 a skeleton frame to which an outer covering or skin (not shown) of any suitable material may be secured.

The tension members 6 and 7 are attached to plates 5 secured to the ends of the compression member 1. The plates 5 are resilient in order to prevent any undue strains on said tension members, or on the distending members 2. 2a or on the compression member 1. The plates 5 may be made of various forms. In Fig. 3 the plates 5 are shown as dished and the ends of the cables 6 and 7 are attached to the peripheries thereof. and the inherent resiliency of the plates equalizes the strain on the several tension members.

The resiliency of the end plates can be enhanced by increasing the number of concentric undulations as indicated in Fig. 5. In some cases the plates may be made with radial undulations as indicated in Fig. 7. In some cases the tension members 6 can be attached direct to the plates 5 as in Figs. 1 and 6; and the spiral tension members 7 could be connected to an auxiliary annular plate 5b seated against the outer side of the plate 5, as indicated in Fig. 6. In the construction

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indicated in Fig. 6 the heavier longitudinal tension members 6 are all connected with the same resilient plates 5 while the lighter spiral tension members 7 are all connected to the same resilient plates 5b, and the one set of tension members does not affect the other, as they would do if all are attached to the same spring plates. In some cases the tension members might be provided with individual tensioning springs, if desired. With the same co-efficient of expansion naturally the longer spiral tension members would shrink and expand more than the shorter longitudinal tension members, but the resilient plates or springs will compensate for the various strains on the members.

The spring plates or connections between the tension members 6 and 7 and ends of the compression member 1 are not provided for creating flexibility in the structure itself, but for preventing undue strains on the individual tension members momentarily put upon them. The aforesaid variations merely demonstrate feasible methods of allowing the structure sufficient flexibility to permit it to " breathe " without throwing any undue strain on any of the lighter tension members. The spiral form of the outer tension member compensates for torsional strain.

The dirigible frame comprising a built up body having a compression member, distending members and outer tension members as above described is of great strength and low weight; in conformity with the scientific laws that (a) the strength of a beam is as the cube of its depth; (b) the surface of circles are to each other as the squares of their diameters; and (c) the volumetric displacement as the mean of the squares of the diameters multiplied by the length.

Thus a dirigible constructed according to my invention will have greater strength in comparison to its weight, and greater volumetric displacement as the cubic content of its volume increases with the square of the diameter of the circular inclosure; thus reducing unit cost for transporting large pay loads.

No claim is made herein to the application of the present invention to airships having means for increasing their aerodynamic efficiency as claimed in my application for Patent No. 33,963/1930 of even date herewith (Serial No. 364,248).

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. A dirigible frame comprising an axially disposed compression member; a series of spaced distending members surrounding the compression member; tension members extending from one end of the frame to the other and connected at intermediate points to the distending members, said tension members spiralling in opposite directions, and characterized by the provision of spring plates connected to the ends of the compression member, to which plates the ends of the tension members are connected to prevent excessive lateral deflecting stresses on the frame from breaking the said tension members.

2. In a dirigible frame as set forth in claim 1 a series of longitudinally disposed tension members connected to the compression member and to the distending members.

Dated this 28th day of July, 1931.

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Fig. 1.

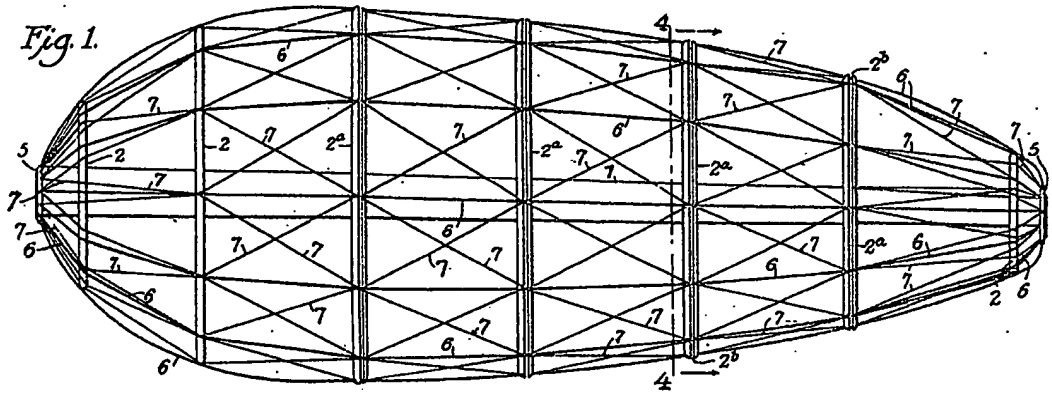


Fig. 2.

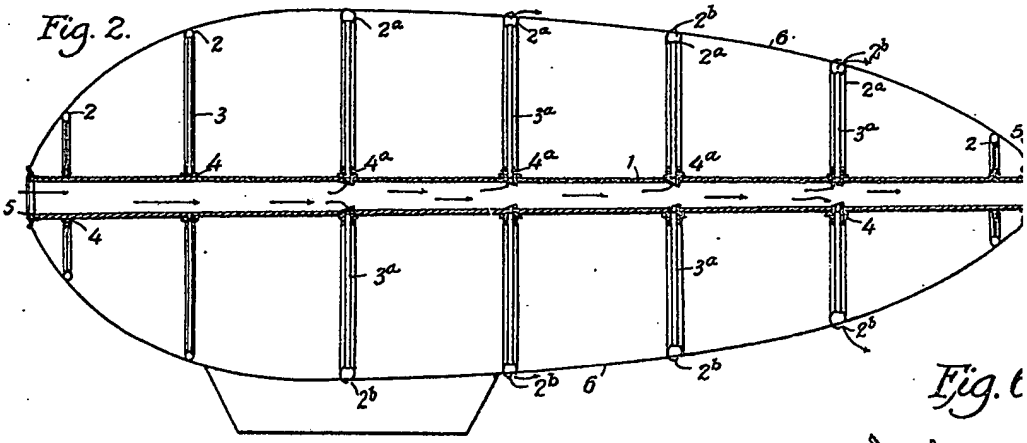
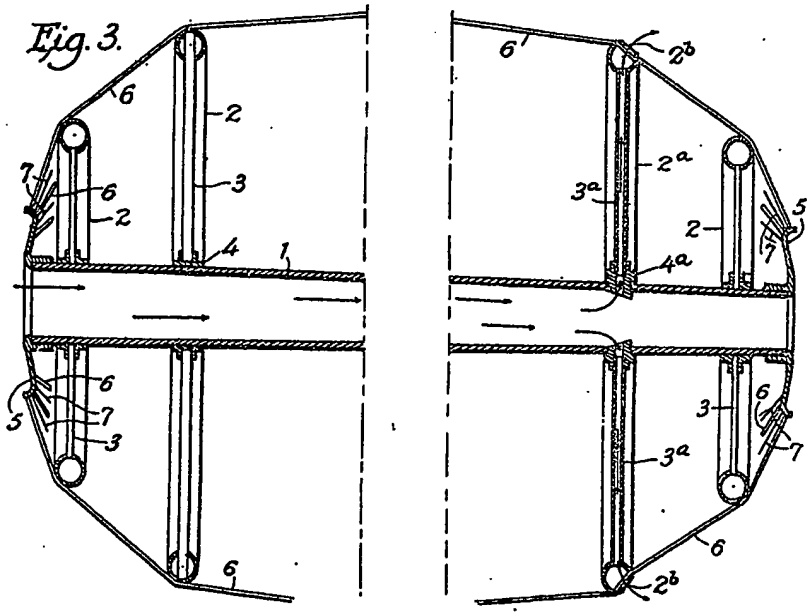


Fig. 3.



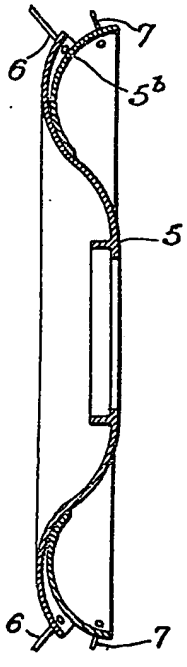
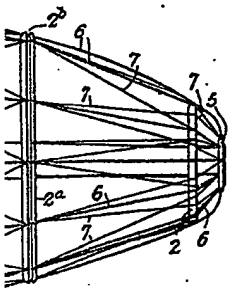
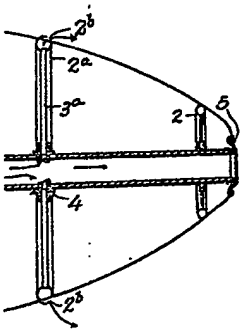


Fig. 4.





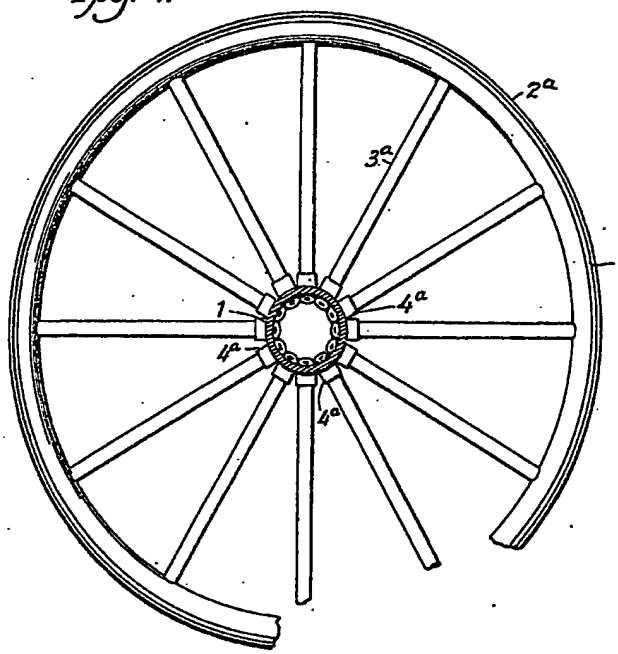


Fig. 5.

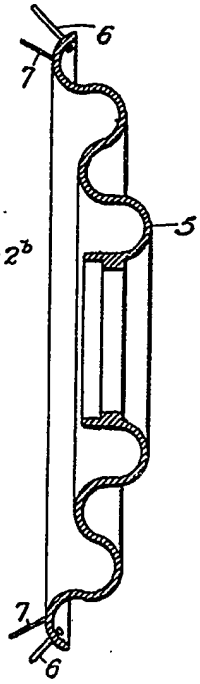


Fig. 6.

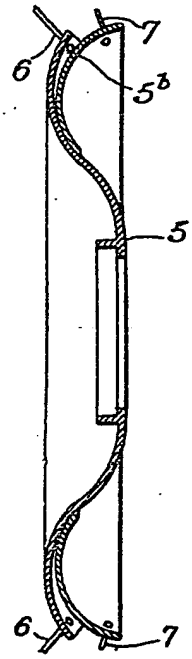
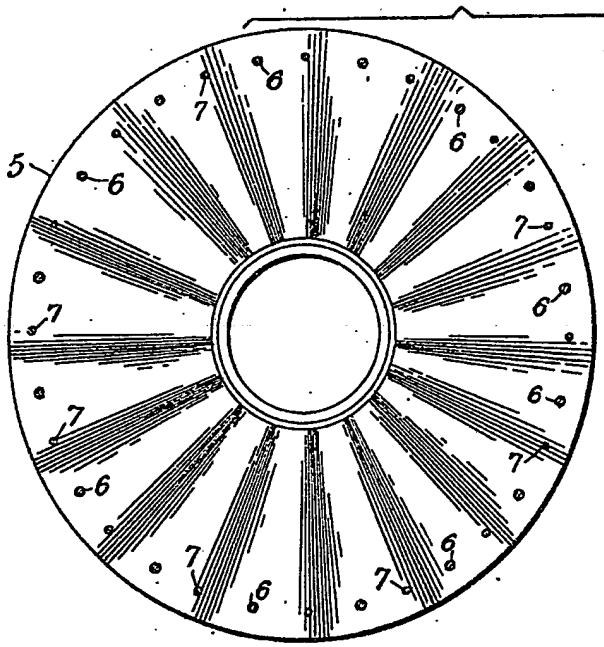
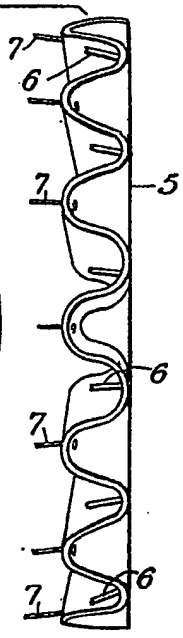


Fig. 7.





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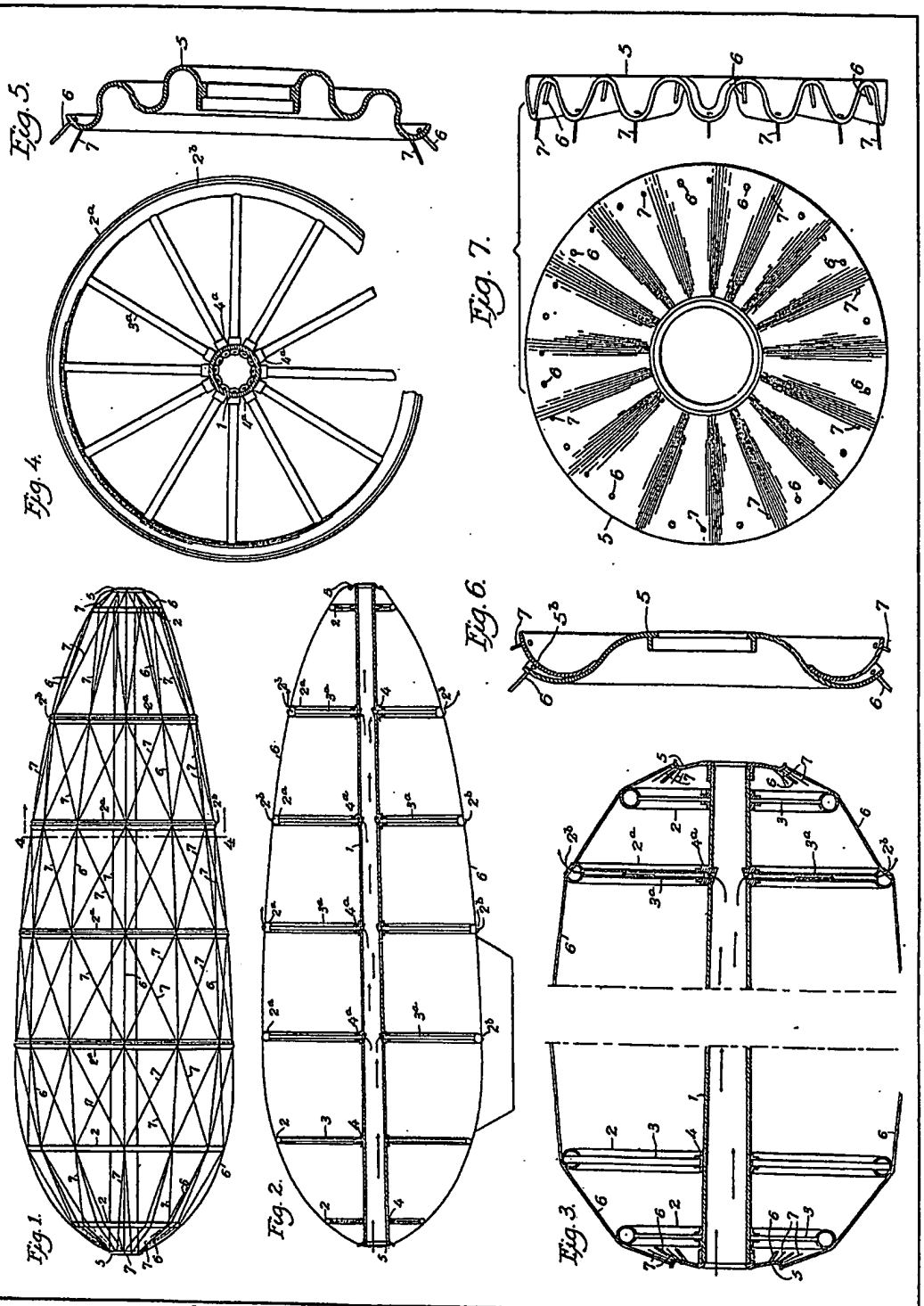

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[This Drawing is a reproduction of the Original on a reduced scale]